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Reduction of Free-Floating Anxiety as a Function of EMG Biofeedback or Deep-Muscle Relaxation Training

Gregory Brown

Western Kentucky University

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Gregory W.
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REDUCTION OF FREE-FLOATING ANXIETY
AS A FUNCTION OF EMG BIOFEEDBACK
OR DEEP-MUSCLE RELAXATION TRAINING

A Thesis

Presented to

the Faculty of the Department of Psychology

Western Kentucky University

Bowling Green, Kentucky

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

by

Gregory W. Brown

April 1976

REDUCTION OF FREE-FLOATING ANXIETY
AS A FUNCTION OF EMG BIOFEEDBACK
OR DEEP-MUSCLE RELAXATION TRAINING

Recommended

April 14, 1976

Date

Richard L. Miller

Director of Thesis

Betsy Houston

Daniel A. Shick

Approved

4-27-76

Date

Edmund Gray

Dean of the Graduate College

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I dedicate this thesis to my parents, Samuel and Jacqueline Brown, and to my wife, Bonnie Brown whose encouragement helped me throughout my academic career.

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REDUCTION OF FREE-FLOATING ANXIETY AS A FUNCTION OF
EMG BIOFEEDBACK OR DEEP-MUSCLE RELAXATION TRAINING

Gregory W. Brown

April 1976

39 pages

Directed by: Richard Miller, David Shiek, and Betsy Howton

Department of Psychology

Western Kentucky University

In an attempt to assess the effect of relaxation training on anxiety levels, a population of 350 students enrolled in Introduction to Psychology classes at Western Kentucky University were administered the Institute for Personality and Ability Testing (IPAT) 8-Parallel-Form Anxiety Battery to screen for 36 high anxiety subjects. These subjects were randomly assigned to one of three conditions: biofeedback, deep muscle relaxation, or control. The biofeedback group received electromyograph training over a three-week period, while the deep muscle relaxation group listened to relaxation tapes. Alternate forms of the IPAT were administered to all subjects at specified intervals to observe changes in the anxiety levels for each group as a function of training. Analysis of the results indicated that no significant differences existed among training conditions. However, significant results were found across training sessions irrespective of training conditions. Discussion centered on the impact of individual differences in performance, differential rates of mastery

and motivational differences of each subject. Additional discussion focused upon the apparent abilities of subjects to achieve physiological relaxation without achieving anxiety reduction.

In stress created by given situations of personal, family, or group interactions, individuals report a general tension, characterized by an "uneasy," "tense," or "uptight feeling." This feeling, commonly termed "anxiety," would seem to have two components: 1) a general increase in muscular tension, and 2) a cognitive component which is reflected in our attitudes towards ourselves and our social environment.

A potentially useful research question relating to the control of anxiety could examine the effect of reduction of muscle tension with biofeedback training using an electromyograph (EMG) or deep muscle relaxation exercises (DMR), hypothesizing that anxiety would become incompatible with the relaxation state and would subsequently reduce, thereby not interfering with behavior. It is believed that both methods could accomplish this task, hence giving the individual more capacity to control anxiety in given situations. Many useful applications would become apparent if the hypothesis were supported. For example, a student confronted with school pressures that seem to be debilitating to him could systematically relax his muscle tension with an accompanying anxiety reduction. A lowered anxiety state would allow him to spend more time and energy in his school endeavors.

Literature Review

In dealing with the concept of anxiety, there were few empirical studies concerned with the use of biofeedback training to control this anxiety. Therefore, one must deal with the concept of anxiety, looking at what it is and how it effects one's behavior. Anxiety is probably a secondary derivative of a human's basic drives such as hunger, sex, (Cattell, 1956) fear, and self assertion (Cattell & Scheier, 1961).

Certain questions arise while looking at anxiety. Does one identify or confuse anxiety with certain primary drives such as fear? Here, fear is defined as a specific quality of introspected emotion with a specific neural and visceral reaction (Cattell & Scheier, 1961). Anxiety is closely related to fear although fear usually is associated with a real object while anxiety may be a vague apprehension of unknown dangers (Cattell & Scheier, 1961). Therefore, it is part of the behavioral arousal system which stimulates the sympathetic nervous system to mobilize visceral responses such as heart rate, blood pressure, and blood sugar content to arouse or alert the organism. If this is true, upon the onset of danger an automatic trigger set off by one's perception of a fearful event cues a response into action such as freezing or flight from

the situation. Triggering of this reaction seems to involve the assessment of the relative strangeness, magnitude, speed, intensity, and possible infliction of pain of the object (Cattell & Scheier, 1961). Cattell and Scheier differentiated anxiety from fear by stating that:

Anxiety differs from fear introspectively presumably physiologically by being a response to precursory signals of perception of the true fear object. It is tentative alerting by cues and symbols rather than by concrete present danger. Consequently, it has the associated qualities of uncertainty about stimulus generalization, the future reference instead of present percept - all suffice to modify the quality, intensity, certainty, and duration of the fear response pattern which we are accustomed to call anxiety (Cattell & Scheier, 1961, P. 12).

The flaw in this interpretation lies in the way anxiety is thought to be a generalization of a response pattern to a threat or fear situation, as well as the pain and danger stimulus which we have already learned triggers fear (Cattell & Scheier, 1961). Attempting to place anxiety into this frame of reference, by stating that extreme deprivation causes pain itself, seems to be a weak argument using the primary needs of human beings (i. e. hunger and threat) to reach the level of becoming physically painful. Using this logic, one could

not support the notion that all anxiety is derived and modified from the innate response pattern of fear, in that one anticipating unsatisfied tension and extreme excitation of any avoidance need elicits the response of anxiety.

In dealing with anxiety and fear, Neal Miller has developed the notion of "acquired drive," referring to stimuli which through a conditioning process comes to possess the functional properties of a primary drive (Miller, 1951). Anxiety and fear are good examples of acquired drives.

In Miller's analysis (1951) fear is an innate response to painful stimulation, and as a response it can be conditioned to an antecedent stimulus. But the fear response also has stimulating effects, which are twofold: first, these can serve as discriminative cues so that differential responses may be attached to them; second, when these fear stimuli become sufficiently intense, they act as driving, motivating stimuli which will energize particular responses instrumental in escaping or avoiding those unpleasant, aversive situations which are arousing the fear. Finally when the conditioned stimuli arousing the fear response are removed, the fear drive is reduced, thus affording reinforcement for any instrumental response just preceding the removal

of the fear stimuli (Hilgard & Bower, 1975, P. 175).

Using Miller's logic, fear and anxiety responses are stimulus bound responses having definite cues to set the organism into a response pattern. Yet, a stimulus-response set may not occur because the individual cannot discriminate the cue discretely enough for him to justifiably attach it to some event. Therefore, he has no response pattern to rely upon for reducing the anxiety attack. Thus the individual has a response of anxiety without any identifiable stimulus to have caused it. This places the individual in a difficult position to deal with the anxiety and makes him a good candidate for some form of training to control this anxiety.

Many theories of anxiety have been reported in the literature as summarized by Cattell and Scheier (1958). Among the first is "characterological" anxiety which is an internal function of one's personality such as temperamental differences, as disposition, timidity or differences in aspiration levels and goals causing the same situation to threaten more loss. A second type of anxiety is "unconscious" anxiety where anxiety comes and goes while the external behavior or psychosomatic dysfunction associated with it sometimes persists. Another type is "bound" anxiety where a reaction occurs only as a specific situation or involves only a specific response as in some phobic or obsessive-compulsive behavior. A fourth form of anxiety, and of principle interest in this experimental

design, is free-floating anxiety. Free-floating anxiety occurs when the individual is not aware that he may justifiably attach it to some object or event. The occasional illogical and maladaptive aspects of free-floating anxiety suggests a form of repression of events linked with anxiety's real course. This type of anxiety can be experimentally produced with injections of adrenalin as reported by Schachter and Singer (1962) and Weiner (1972). These studies indicate that subjects with high anxiety states also have high adrenalin levels. Therefore, by injecting nonanxious subjects with adrenalin, similar behavioral criteria were observed in these subjects that were also exhibited in the highly anxious subjects. Here induced free-floating anxiety would be related with anxiety described as pathological in the sense that it is not related to situational cues.

A number of methods have been developed to control anxiety. Jacobsen (1938) began the use of "progressive relaxation" in a clinical setting to help neurotic patients displaying anxiety. This application was formulated on the assumption that decreases in muscle tension would lower excitation of emotional arousal systems; therefore developing an incompatible state with the components of the anxiety syndrome. Using this logic, it was believed that drugs that decreased muscle tension would have the same effect without the complex training connected with "progressive relaxation." Among the first tranquilizing drugs studied was meprobamate. After the

first clinical results were published in 1955 by Selling, meprobamate enjoyed rapid and wide acceptance in the treatment of various psychoneurotic states. Many reports were presented in early years for clinical application concerning the effectiveness in conditions in which anxiety and tension were variables (Berger, 1966). The effects of meprobamate are as follows: 1) paralysis at high doses and loss of muscle tone at small doses, 2) anticonvulsant action, and 3) rapid reversibility of effects. One particular attribute meprobamate has over sedative drugs like barbituates is its anxiety curing effects. In comparison with other available drugs, meprobamate produced relaxation at a dosage level not affecting motor or intellectual performance as did barbituates and possesses effects of drowsiness and some allergic reactions (Berger, 1966). The biggest drawback to this drug is that over prolonged periods of time, it leads to tolerance requiring larger dosage levels for effective treatment, and physical dependence complicating withdrawal. Withdrawal symptoms are very similar to barbituates such as tremors, ataxia, hallucinations, anxiety and possible grand mal seizures (Berger, 1966).

Another class of tranquilizing drugs used in clinical therapeutic applications is the benzodiazepines. The clinical therapeutic application of the benzodiazepines are very similar to those of meprobamate, being used to treat conditions such as phobic reactions, hypertension, anxiety states and alcoholism (Berger, 1966). The benzodiazepine drug group is reported to be a superior drug to meprobamate

in the treatment of anxiety patients, although support for this assumption is usually based only on the comparative number of prescriptions filled by pharmacies. Similar to meprobamate, repeated therapeutic use of the benzodiazepines leads to tolerance with a need for increased dosage levels to sustain its therapeutic value. However, it seems to have more of a sedative effect on a subject than anti-anxiety effect. Prolonged use builds physical dependence with similar withdrawal symptoms as meprobamate (Longo, 1972).

Wolpe's systematic desensitization constitutes another technique for controlling anxiety using progressive relaxation and on occasion tranquilizing drugs. This method is found in his book Psychotherapy by Reciprocal Inhibition and is used for removing phobic anxiety reactions (Wolpe, 1958). This method of therapy has three basic steps: 1) training in progressive relaxation with or without the use of drugs or hypnosis, 2) construction of one or more individualized anxiety hierarchies, and 3) a systematic desensitization procedure. When the hierarchy is complete and the relaxation training is sufficiently well advanced, the program may begin. This involves presenting a low anxiety item from the bottom of the patient's hierarchy while he is in a state of relaxation. Therefore, the patient has minimal arousal of anxiety due to his incompatible state of relaxation. The anxiety has been reciprocally inhibited (Wolpe, 1958), and after several presentations the patient becomes

desensitized and begins to tolerate the item. This approach is continued, moving up the hierarchy, until an item is presented that creates too much anxiety for the patient to tolerate. When this occurs, the item should be removed and the therapist should move back to an item that the patient can tolerate and then advance again up the hierarchy. This procedure continues until the anxiety reaction is within acceptable limits for the item on top of the patient's hierarchy.

Traditionally patients were taught by the therapist to relax prior to the onset of therapy or systematic desensitization. More recently therapists such as Lazarus (1965) and Cotter (1970) have studied relaxation training with prerecorded tapes. These tapes take the patient through each phase of relaxation without the therapist being present. All the patient is required to do is listen to the instructions and practice what the tape asks him to do. This method of training relaxation may be achieved in many ways with the added advantage that it may be done at the subject's own discretion as to time and place. Each tape focuses upon specific muscle groups which are to be relaxed in a specified order using a "differential" approach to muscle relaxation. The differential approach employs awareness of the different states as opposed to relaxation states to develop a more acute awareness of the relaxed state and tense state. Prerecorded relaxation tapes have removed the therapist from a very time consuming training period so that he may have more time to spend on other aspects of the therapy

(Lazarus, 1965).

Two pioneers in the area, Luthe (1969) and Jacobsen (1938, 1970) have been successfully training patients in muscular control and autonomic functions for a number of years, believing that tension interfered with rational adjustment and that training of patients in relaxation would aid them in adjusting to their environment. Since progressive relaxation is an intricate part of therapy, it becomes apparent that biofeedback techniques for relaxation could aid in this process. Biofeedback relaxation training could be achieved faster than progressive relaxation (with or without drugs), while the therapist would have quantifiable information to check the relaxation success rate; therefore, aiding in the process of anxiety reduction and control. With instruments like the electromyograph (EMG), muscle activity can be displayed on feedback to the patient to aid in his controlling specific muscles. Budzynski and Stoyva (1969) studies describe how EMG activity is transferred into an auditory signal reflecting the relative activity of the muscles, therefore providing more information to the subject to be processed in controlling specific muscle groups.

Applications of biofeedback have been developed for heart rate (Thornton & Van-Toller, 1973; Wells, 1973), blood pressure (Elder, Ruiz, Deabler, & Dillenkoffer, 1973), hypertension (Schwartz & Shapiro, 1973), tension headache (Sargent, Green, & Walters, 1973; Wickramasekera, 1973), and anxiety (Raskin, 1973). It is the latter which is of principle interest for this study. The work of Raskin,

Johnson, and Rondestvedt (1973) has specified the potential value of the EMG training in the alleviation of general anxiety. Their technique has consisted of training their patients to control a specific group of forehead muscles (the frontalis) under the supposition that by lowering the activity of these muscles, one would therefore have generally beneficial effects on anxiety via a general lowering of arousal level.

The patients reported upon in this study had suffered from severe anxiety over many years and had received many forms of therapy without success. These patients were trained a total of forty hours in frontalis muscle relaxation through auditory feedback in an attempt to achieve relaxation, which was defined as a significant reduction in EMG activity from pre-training levels. Deep muscle relaxation was achieved by all patients over periods ranging from two weeks to three months. The pre-training muscle activity levels averaged 14.1 μ v with this level being reduced by 50-87.5% following training. Six of the ten patients did not show any improvement in overall anxiety. Those who did improve reported that they could not use the training to specifically prevent an anxiety attack; however, they could reduce the severity of such an attack when it occurred while they were alone (Raskin et al., 1973). Six of the above patients were manifesting insomnia as a function of their anxiety. Of these, five reported that biofeedback training aided their falling asleep, but did not stop subsequent waking (Raskin et al., 1973). Training in frontalis muscle

relaxation of four patients who suffered from tension headaches had a dramatic affect in reducing the severity of the headache. The investigators found these results very encouraging, given the degree of many disorders with which they were dealing.

In light of the information presented, it was hypothesized that if muscular tension is reduced independent of free-floating anxiety, then such anxiety should also decline. Both the biofeedback training with EMG and the deep muscle relaxation exercise tapes (DMR) should prove effective in reducing muscle tension with concurrent reduction of "free-floating" anxiety.

Method

Experiment 1

Subjects. Approximately 350 students, enrolled in Introduction to Psychology courses at Western Kentucky University, were administered the Institute of Personality and Ability Testing (IPAT) 8-Parallel-Form Anxiety Battery Form A (Cattell & Scheier, 1973). Of the 350 students, 30 scored above the pre-established definition of high anxiety which was set at the 89th percentile or above. When contacted, 18 subjects indicated they would participate in a relaxation training experiment. Each of the subjects was randomly assigned to one of the three design conditions. Six subjects participated in the biofeedback condition (Group 1), six in the muscle relaxation exercise tapes (Group 2), and six in the control condition (Group 3).

Apparatus. Specific equipment used in this experiment consisted of a Narco Bio-System EMG Biofeedback Monitor NB-222 and surface electrodes for the biofeedback group. The Lazarus DMR exercise tapes series one, two and three were used for the muscle relaxation group. (These tapes employ the development of relaxation techniques moving from physical awareness in tape one, to a cognitive awareness in tape three, with a combination of both so the subject becomes proficient at relaxation.) "Free-floating" anxiety was

assessed by the IPAT 8-Parallel-Form Anxiety Battery (Cattell & Scheier, 1973) chosen over alternative instruments such as the Taylor Manifest Anxiety Scale (Taylor, 1953), because of its existing multiple parallel forms which have demonstrated reliability (Cattell & Scheier, 1973).

Procedure. Biofeedback subjects (Group 1) were introduced into the experimental setting and asked to complete Form B of the IPAT 8-Parallel-Form Anxiety Battery. Upon completion of this task, each subject was told that he or she would train to relax with the aid of an EMG biofeedback machine. The three surface electrodes were then placed on the frontalis muscles one inch apart. The subject was instructed to reduce the feedback tone utilizing any method of his or her choice, and if he or she were successful at reducing the tone, to capture the feeling and try to maintain a low muscle activity level. At the beginning of the training session, the subject was asked to get comfortable and begin relaxing while the relative muscle activity level, as indicated by the EMG monitor, was set at 75% of full scale. A successful relaxation training session occurred when the subject lowered the tone and relative activity level to 40% or lower, relative to his or her beginning level, and maintained this for 10 minutes of the 20 minute training session. Irrespective of whether a subject met the established criteria for success, each subject received two 20-minute training sessions a week spaced at intervals of either Monday and Wednesday or Tuesday and Thursday. Data were collected at

the end of sessions two, four, and six, at which time the subjects were required to complete alternate forms of the IPAT 8-Parallel-Form Anxiety Battery. Seven to nine days after training, a follow-up measure of anxiety was obtained from each subject, along with the experimenter's debriefing the subjects concerning their performance in the experiment.

Subjects of muscle relaxation (Group 2) were introduced into the experimental setting and asked to complete Form B of the IPAT 8-Parallel-Form Anxiety Battery. The subject was then instructed he or she would be listening to a tape that would aid in relaxation. Each subject was given an explanation of the differential relaxation approach, being informed that he or she would be asked to become aware of tension by tensing muscles and then contrasting it with relaxation for a more acute awareness of the relaxed state. Within each training session, subjects were periodically observed to make sure they were actively taking part in the training. If a subject were not actively following the instructions from the tape, the tape was stopped and he or she was removed from the experiment. Subjects in the muscle relaxation group were trained twice a week on a schedule coinciding with that of Group 1, using tape one for the first week, tape two for the second week, and tape three for the third week. A follow-up measure of anxiety and debriefing session similar to that of Group 1 was scheduled seven to nine days following training.

Group 3 served as control subjects, periodically being asked to come in and complete different forms of the IPAT 8-Parallel-Form Anxiety Battery. After the two pre-tests were administered, each subject completed a form weekly for a four-week period, on a specified day coinciding with the same schedule being used for the experimental groups.

Analysis of Data. An analysis of variance for repeated measures was conducted on the anxiety scores yielded within training sessions for the EMG, relaxation, and control conditions. Additional analysis was done to test for potential differences existing between the two pre-test conditions utilizing a Student's t-test for matched groups.

Experiment 2

Subjects. In this experiment, 250 students enrolled in Introduction to Psychology at Western Kentucky University were administered the IPAT 8-Parallel-Form Anxiety Battery Form A. Of these students, 30 scored above the pre-established definition of high anxiety which was set at the 77th percentile or above. When contacted, 18 subjects indicated they would participate in a relaxation training experiment. The subjects were randomly assigned to groups as in Experiment 1.

Apparatus. Specific equipment used in Experiment 2 consisted of the Narco EMG Biofeedback Monitor NB-222 and surface

electrodes for the biofeedback (Group 1). The Lazarus DMR exercise tapes series one and two were used for the muscle relaxation (Group 2). The IPAT 8-Parallel-Form Anxiety Battery (Cattell & Scheier, 1973) was used to measure free-floating anxiety.

Procedure. Procedures for the biofeedback (Group 1) and muscle relaxation (Group 2) were the same as Experiment 1, changing only the time span of training and order of test forms. The biofeedback group moved from six 20-minute training sessions, over a three week period, to three 40-minute training sessions over a seven day period. A latin square design was used to randomize the order of the test forms to control for any test form variability. Changes in the muscle relaxation group were from six training sessions, two sessions per tape, over a three week period, to three double sessions using tapes one and two for each session. Randomization of test forms was done as in Group 1.

In both groups, data were collected at the beginning of the first training session and then at the end of each consecutive training session. During this experimental phase, an interim analysis of variance was conducted following the second training session. The results indicated that the data being collected were very similar to that of Experiment 1. Therefore, a decision was made to terminate the experiment upon completion of the second training session, and to use the data to analyse differences between the two pre-test conditions.

Results

Experiment 1

The raw scores achieved on IPAT forms were converted to standard scores based upon the parameters of each form, due to the fact each had a different normative mean and standard deviation. This conversion is expressed in the following formula:

$$\frac{X \text{ raw score} - \mu \text{ form}}{\sigma \text{ form}}$$

One set of scores in the biofeedback group was dropped from the analysis because the subject failed to meet the criteria for relaxation. All of the subjects in the muscle relaxation group achieved the criteria for success in their training.

Table 1 presents the means and standard deviations for each group for all test conditions. These data are graphically represented in Figure 1, which displays the mean for each group as a function of training sessions. Observation of this figure indicates that the mean performances of the biofeedback and muscle relaxation group anxiety scores were lower than the control group across training sessions. The biofeedback group was lower than the muscle relaxation group, adding support to the notion that biofeedback was more effective in reducing anxiety.

Biofeedback group. Standard scores for the biofeedback group

Table 1
Means and Standard
Deviations for Each Test Condition

Test Sequence	Biofeedback (Group 1)		DMR (Group 2)		Control (Group 3)	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
PRE	.41	.35	.85	.72	.87	.41
1st	-.29	.83	.63	.84	.91	.56
2nd	.61	1.12	.70	1.21	1.00	.73
3rd	.48	1.33	.93	1.00	1.67	.84
Post	1.08	1.41	1.34	.75	1.14	.41

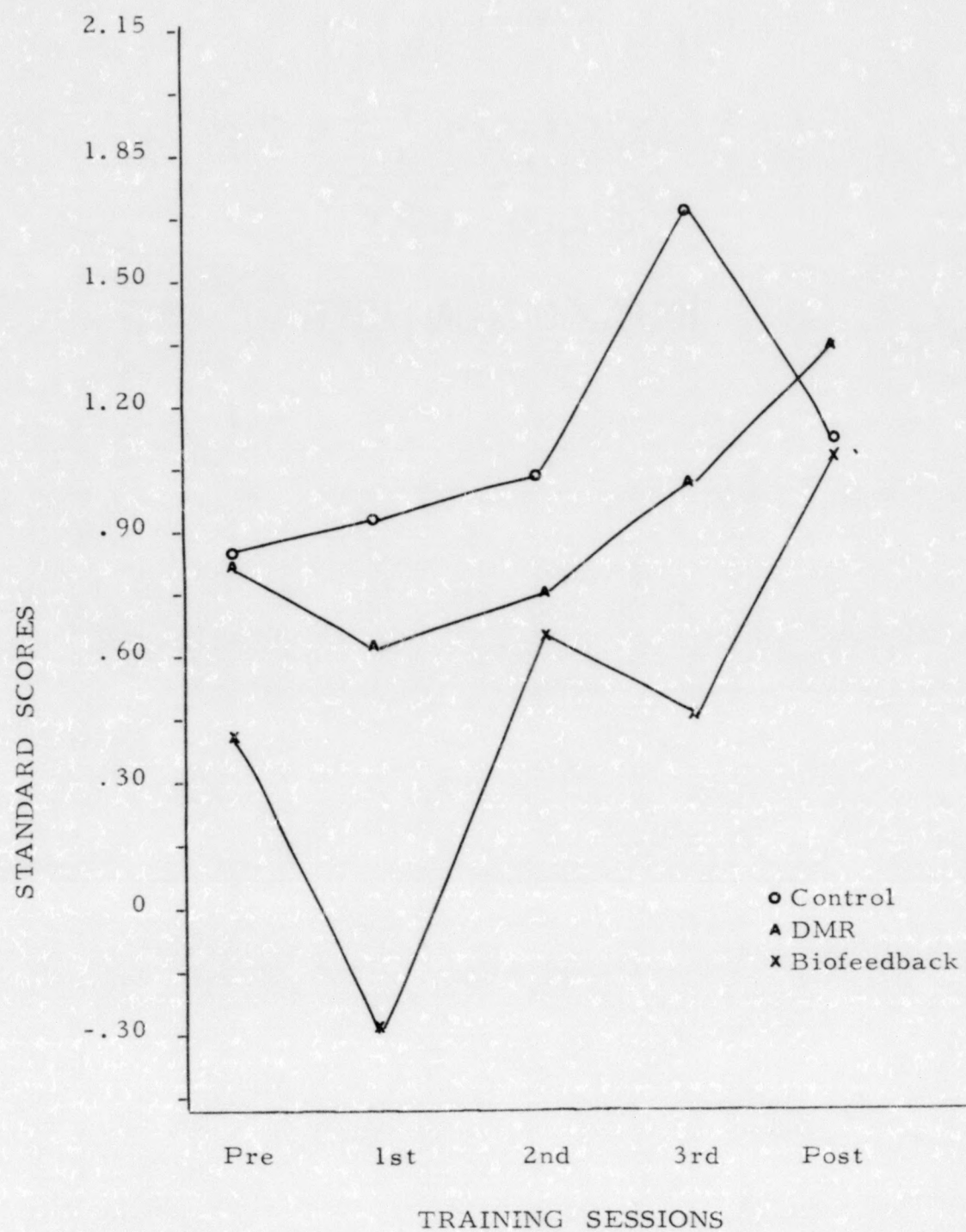


Figure 1. Mean standard score performance as a function of training sessions.

ranged from -1.3 to 1.76 standard deviations. As can be seen in Figure 2, four of the five subjects moved rapidly down in anxiety, but could not maintain this level, subsequently rising above pre-test levels, and sustaining these higher levels for the balance of the experiment, including the post-training follow-up.

Muscle relaxation group. The muscle relaxation exercise group standard scores ranged from -.58 to 2.51 standard deviations as indicated in Figure 3. Again, observation indicates that large amounts of variability existed from subject to subject without any consistent pattern being observed. This group did not exhibit the initial downward and subsequent upward movement as did the four subjects in the biofeedback group.

Control group. The control group did not have as large a standard score range as did the experimental groups. Subjects' scores fell between .15 to 2.14 standard deviations as represented in Figure 4. Again, no consistent pattern was observed, yet the scores remained higher for this group as compared to the experimental groups.

Factorial analysis. No significant differences were found to exist in the factor of training conditions ($F(2, 12) = 1.82$ $p > .01$); however, a significant difference did exist across training sessions ($F(4, 48) = 6.33$, $p < .01$). A graphical representation of this difference is shown in Figure 5 in which all design conditions were collapsed to present the average performance across training sessions.

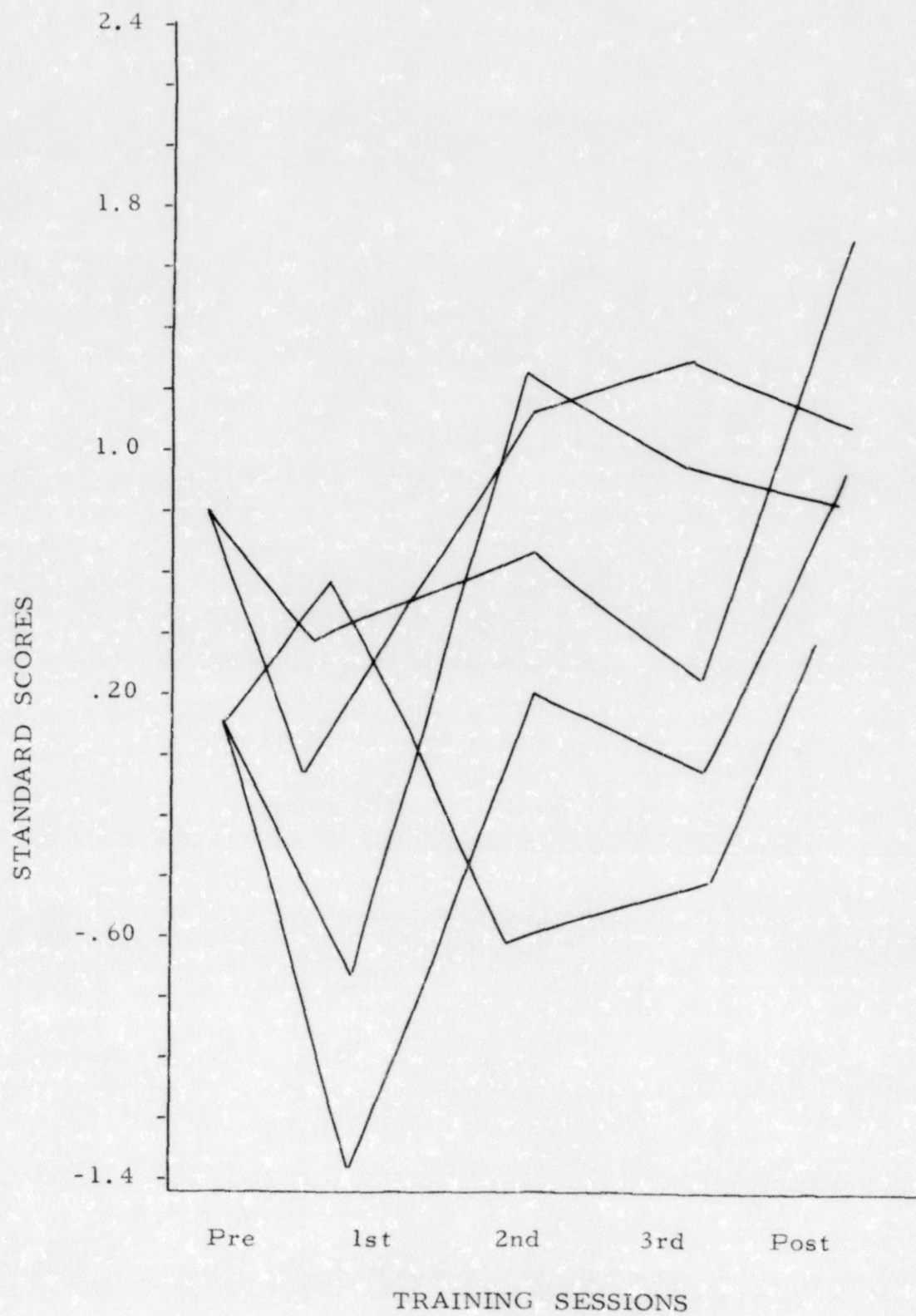


Figure 2. Individual biofeedback performance across training sessions.

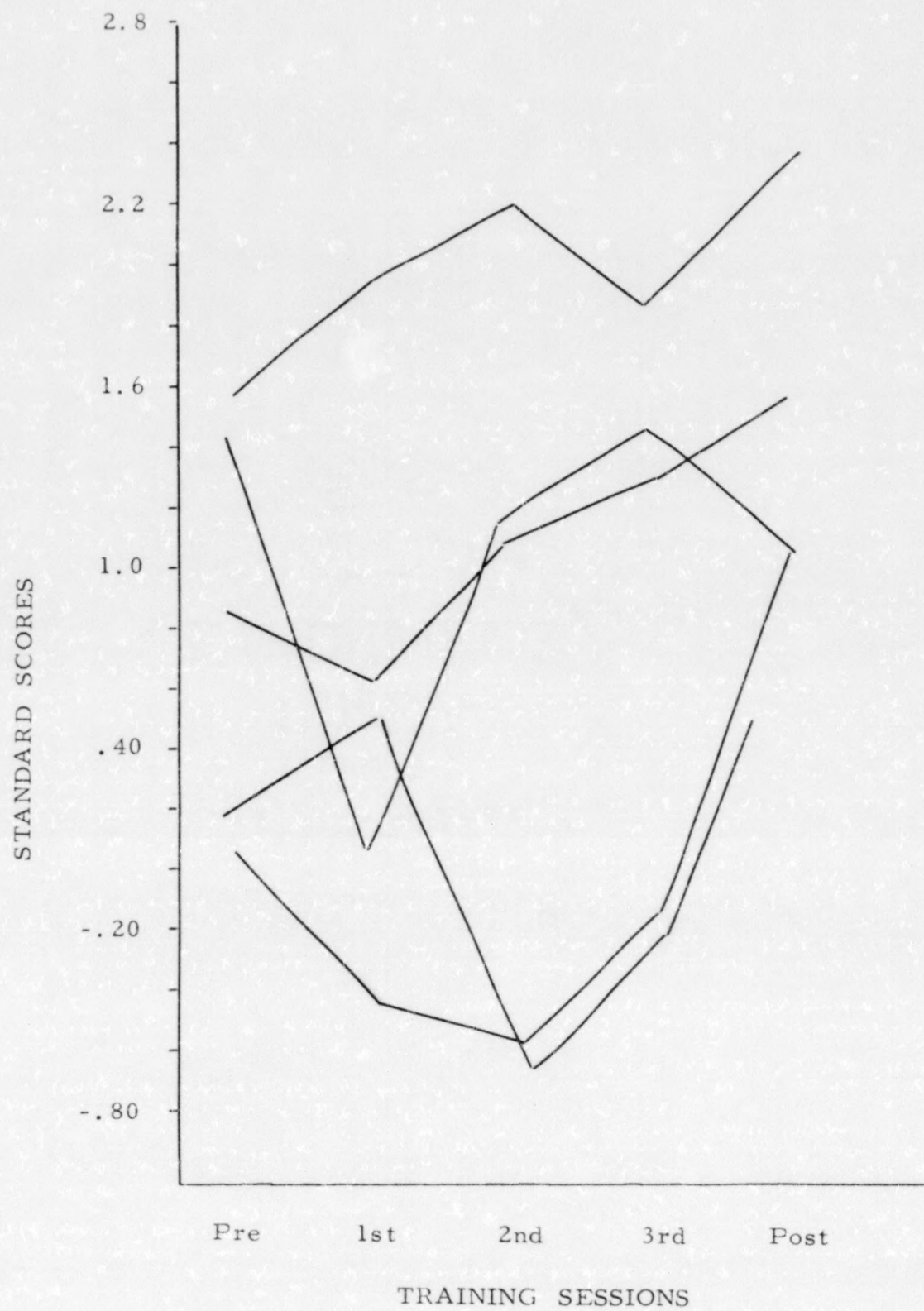


Figure 3. Individual muscle relaxation performance across training sessions.

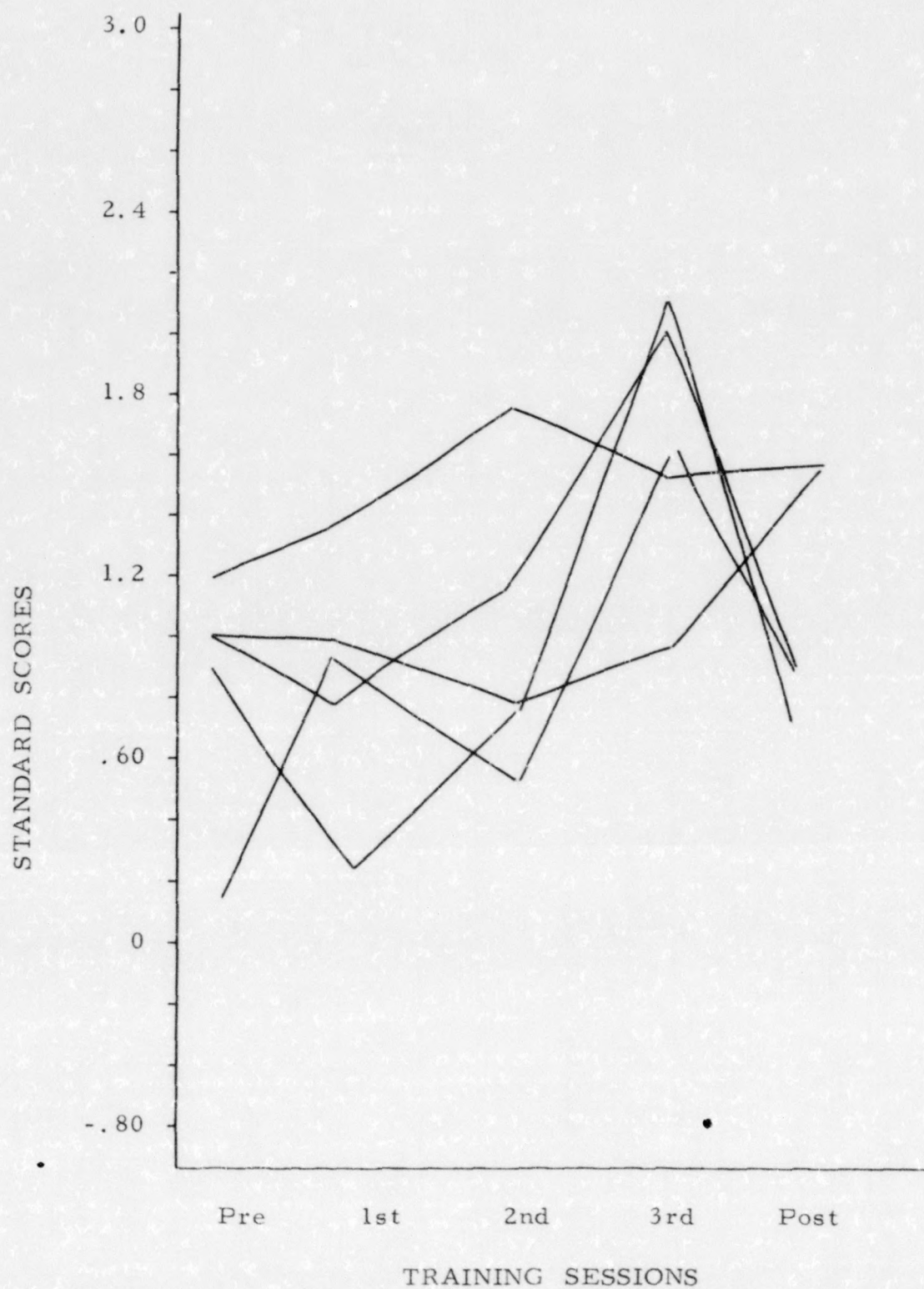


Figure 4. Individual control group performance across training sessions.

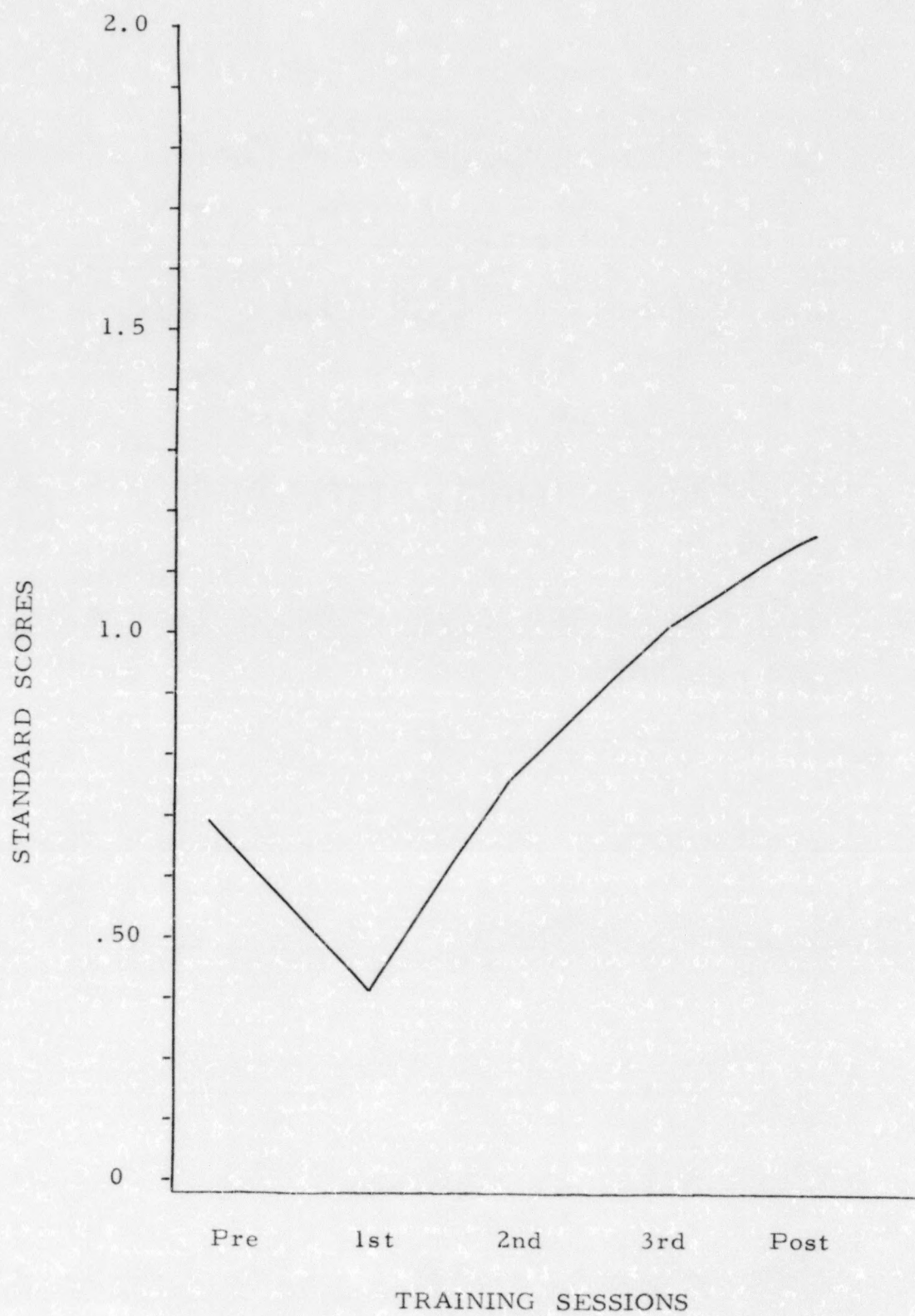


Figure 5. Average standard score performance as a function of training sessions of all groups.

Figure 5 shows a rapid downward movement with a gradual rise to above initial anxiety levels across training sessions. Figure 6 represents the separation of experimental from control conditions, displaying evidence that the control is higher while the experimental groups remain lower than the average of the two together. This figure shows that the experimental groups have the same downward movement and subsequent rise in anxiety levels as the average, while the control remains consistently higher with a sharp rise in the latter part of the experiment. These data would seem to indicate that there is an effect in the nature of training for reduction of anxiety in comparison with the control group, although such an effect may be statistically obscured by the large within-group differences seen in this experiment.

Experiment 2

The data were analyzed in Experiment 2 in the same manner as Experiment 1. No significant differences were found to exist among training conditions ($F < 1.0$), and additionally, no significant difference was found across training sessions ($F(2, 24) = 1.27, p > .01$).

Table 2 represents the means and standard deviations for each group ranging from pre- to second test administration. The DMR group in Table 2 has standard deviations twice that of the DMR group in Table 1, while the biofeedback group has similar standard deviations in both tables. This would indicate that the DMR group variability may have influenced the statistical significance.

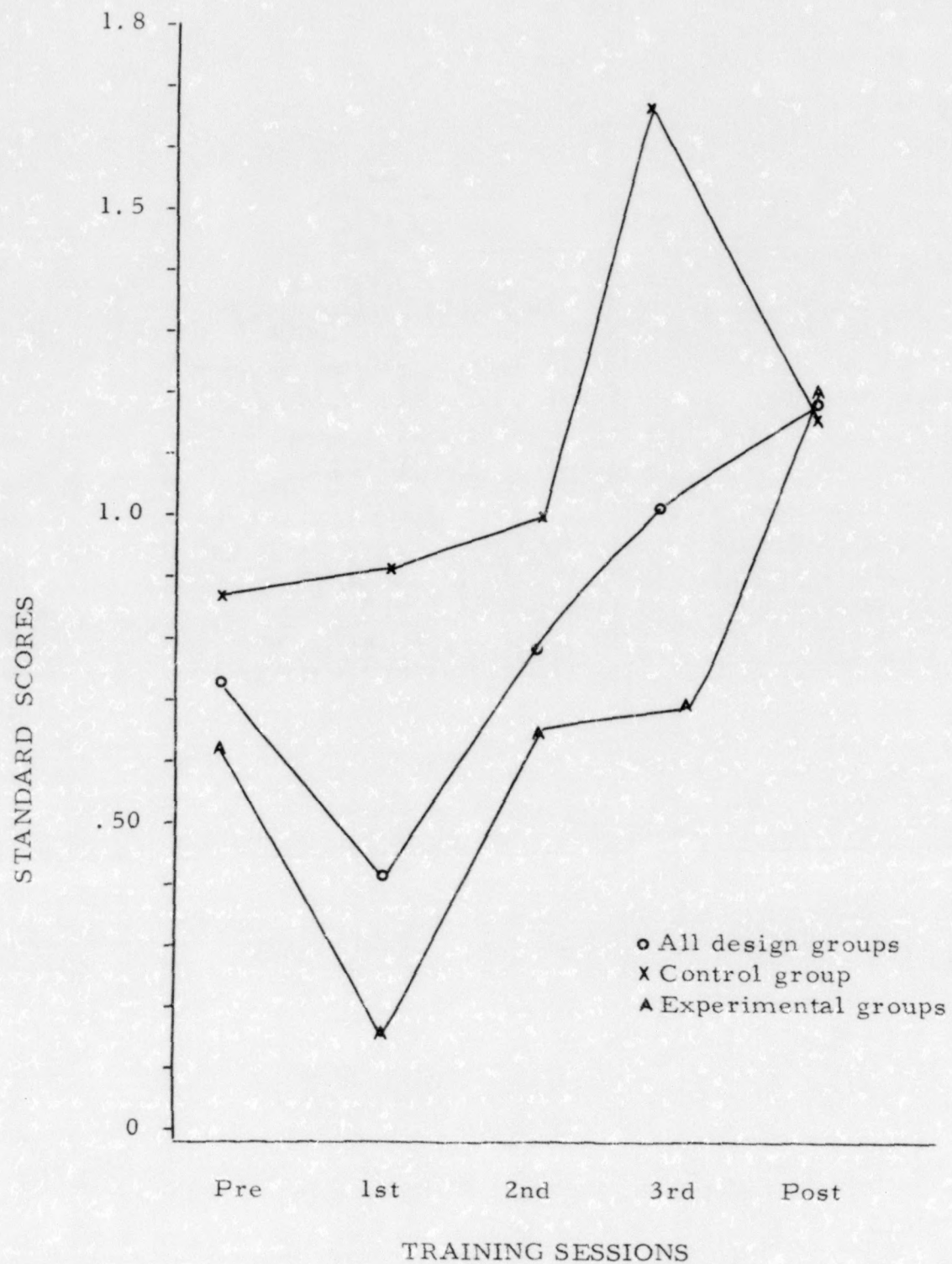


Figure 6. Experimental groups and control group mean standard scores compared to the average standard scores across training sessions.

Table 2
Means and Standard
Deviations for Each Test Condition

Test Sequence	Biofeedback		DMR		Control	
	(Group 1)		(Group 2)		(Group 3)	
	\bar{X}	SD	\bar{X}	SD	\bar{X}	SD
Pre	.64	.44	1.01	1.69	.87	.41
1st	.69	.56	1.36	1.46	.91	.56
2nd	.55	.55	.35	.56	1.00	.73

Figure 7 represents the average standard score for all three conditions collapsed together for each test administration. Figure 8 is a representation of performance under each training condition across sessions. As can be noted, large individual differences existed across training sessions. Observation of this figure shows that the biofeedback group remained lower than both the other groups, while the muscle relaxation group was higher than the control. The muscle relaxation group had rapid upward movement with subsequent rapid downward movement, while the biofeedback and control groups had gradual movements across training sessions. This indicates that the pattern observed in Experiment 1 was not observed here.

Analysis of Pre-Test Conditions

The initial pre-test administration was given in a group setting with these scores being used to screen for subjects meeting the criteria of high anxiety. A second pre-test administration on an individual basis was given in the experimental setting to establish that the subject's first test score was not due to some situational variable present in the group testing. Because of the nature of the two pre-test conditions, it was believed that differences could exist. Therefore, a Student's t-test for matched groups was conducted to establish if any differences did in fact, exist between pre-test conditions. A significant difference was found ($t(28) = 4.17, p < .01$).

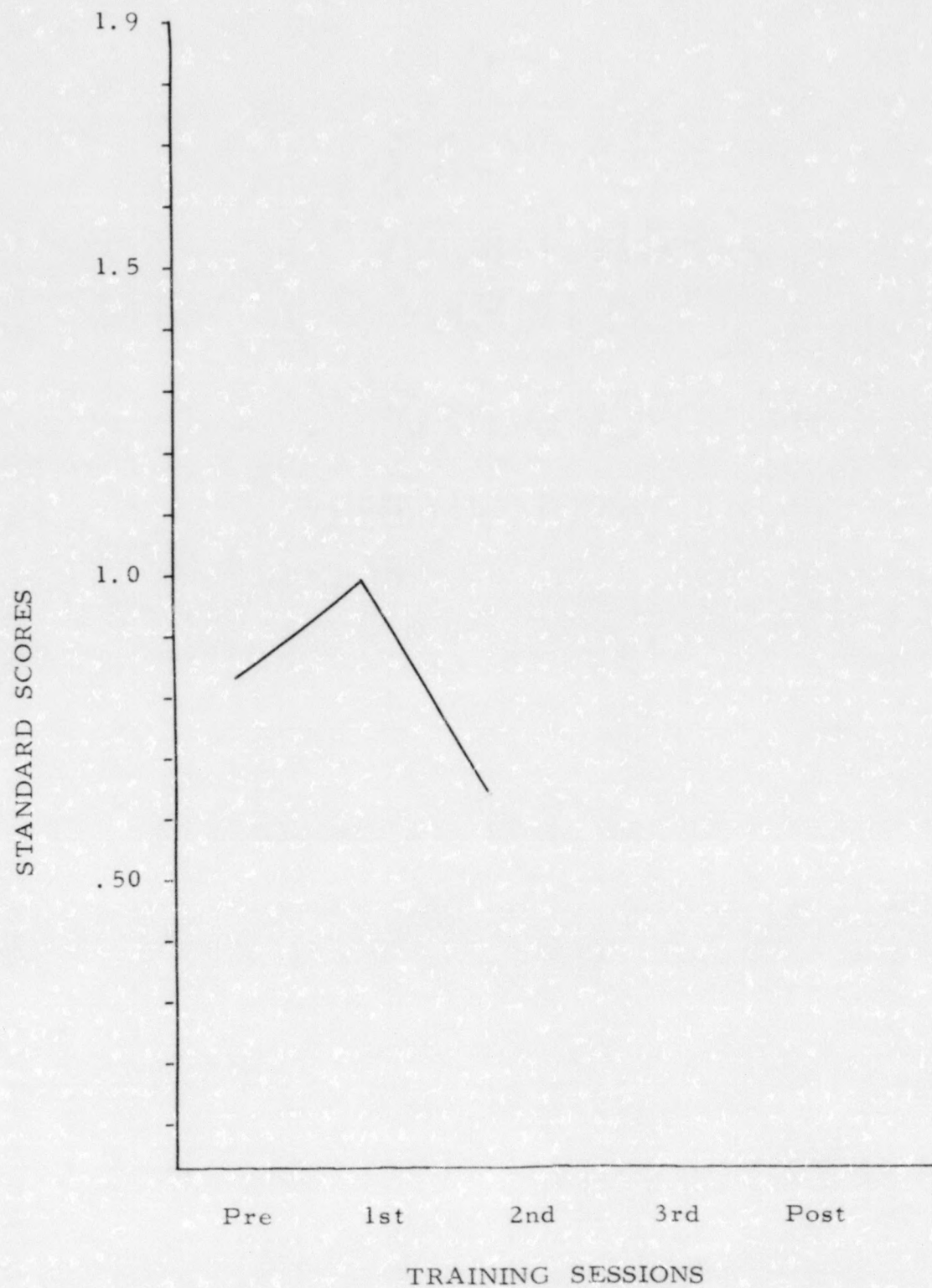


Figure 7. Average standard score performance as a function of training sessions of all groups.

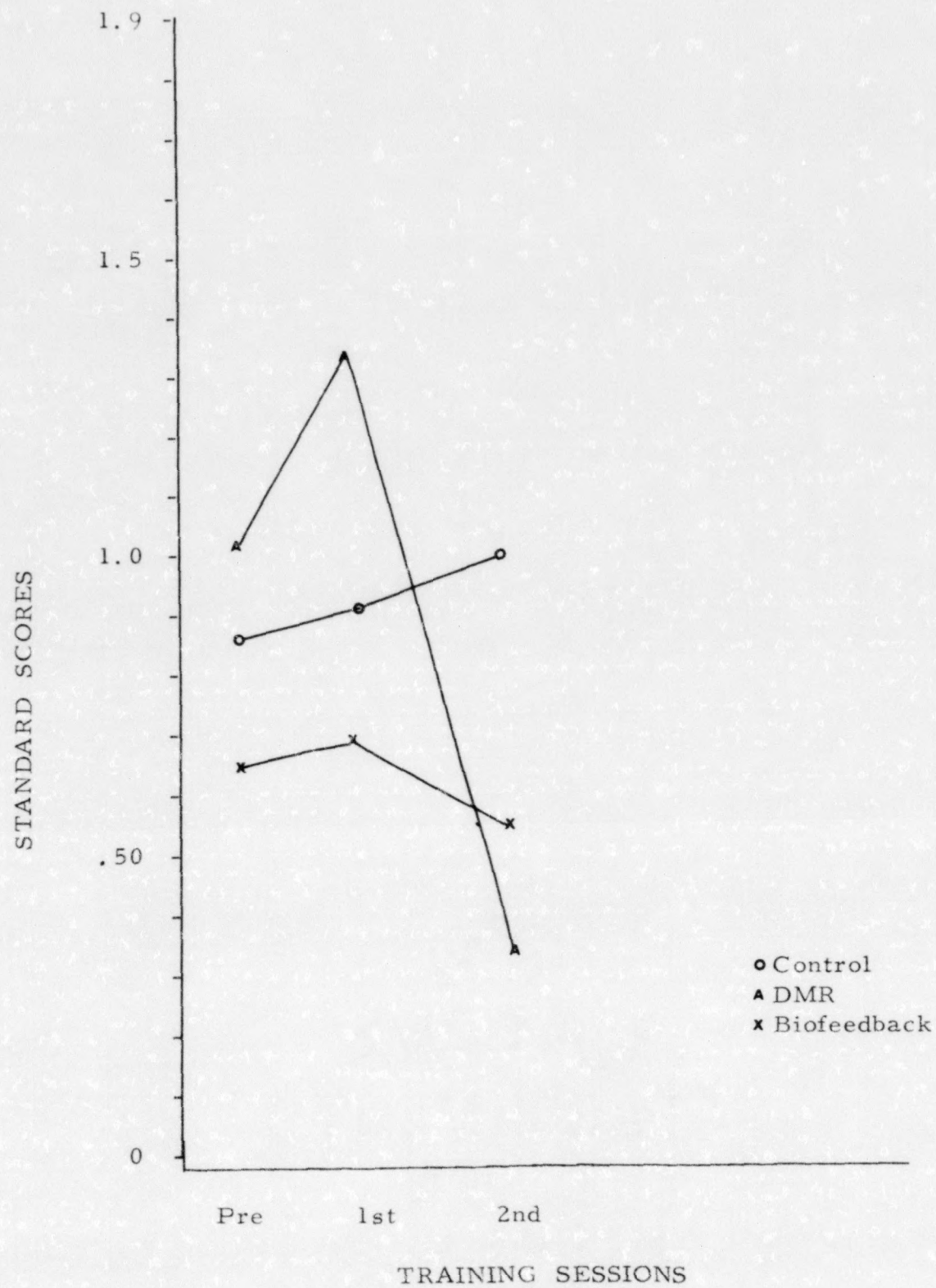


Figure 8. Mean standard score performance as a function of training sessions.

Discussion

Although it was hypothesized that both biofeedback and deep muscle relaxation training would reduce anxiety, the results did not clearly support these contentions. The lack of statistical significance among training conditions might have been attributable to a number of factors which apparently affect mastery of the training technique of relaxation. Observable in this experiment were wide individual differences of each subject within training conditions, temporal differences of training effects, and inconsistent motivational characteristics of each subject. Raskin et al. (1973) reported that individual subjects vary from several weeks to several months in their ability to master the task of relaxation. These differences in individual ability become apparent in the biofeedback group, in which one subject required two weeks of training before he lowered anxiety, while the rest of the group did so after the first week. Within this group, the pattern of change in anxiety was similar for all subjects, including the one discrepant participant who lagged behind the balance of the group. In fact, if the plot of his data were adjusted back two sessions, his anxiety pattern becomes completely consistent with the group performance. Such a time lag in training effect minimized the impact of the statistical analysis of the effect of training condition.

Another factor potentially influencing the results involves the motivation of each subject. The novelty of the training situation may have induced a high degree of subject's cognitive involvement, thereby causing the observable drop in anxiety as initial relaxation was achieved. If such were true, a subject might be expected to display a change in his or her cognitive involvement at that point at which no further relaxation was possible. Novelty to the task might be lost, and coincident with the decline in novelty, a subject might be expected to cognitively disengage from the task, focusing upon the extrinsic reinforcer available to all subjects - that of class credit. Remaining in training sessions under these circumstances would not necessarily be conducive to anxiety reduction. In Raskin's et al. (1973) article, emphasis is placed on the correlation a muscle group has with the particular disorder being treated. Therefore, the results of biofeedback training may prove to be negligible when a high correlation between a muscle group and the disorder cannot be demonstrated, such as would be the case when task novelty is lost.

The motivational characteristics of the DMR group may have been directed toward the extrinsic reinforcement of class credit rather than the reinforcement gained from active participation in relaxation technique. This type of motivation may have influenced the subjects to passively remain in the experiment without any real motivation towards achieving the training technique, because of the

lack of identifiable relevancy of the task to the subject's own needs.

The implication of the effect of individual differences in the present design become apparent when one examines the dispersion and inconsistent movement of anxiety scores in the DMR group across training sessions. Lazarus (1965) reports that progression through the DMR tapes depends upon the subject's ability to perform and utilize the preceding tape. The results indicate that certain subjects, although working with the tape, were unable to substantially lower their anxiety. It appears that either these subjects could not effectively comprehend and utilize the instructional information of the tapes at the pace at which they were presented, or they refused to become actively involved in the relaxation process.

Individual differences are further exemplified in the control group. This is evident in the variability these subjects displayed in their anxiety scores. These scores were not consistent either within a subject's own testing sequence, or among subjects within the group. Since one expects a consistent pattern to exist in the control group, the variation present supports this experimenter's belief that individual differences did influence the results of this experiment.

At this point one might ask: how can anxiety levels be rising while the criteria for relaxation is being achieved? The answer may lie in whether the subject considers the relaxation training to be relevant to his or her immediate needs. If the training does not provide any such support, then anxiety would not be expected to decline

with further involvement in training. In fact, forced participation under these circumstances might be expected to produce boredom with subsequent rise in anxiety.

The practical implications of this study are believed to be related to the relaxation techniques used in the control of anxiety. The use of biofeedback training could be aided with the utilization of situational variables such as multiple sensory cues (i. e., lights, tone, etc.) on individual biofeedback units, subject's ability to alter physical activity states upon command, and additional biofeedback equipment utilized in concomitant involvement by a subject. This approach would help alleviate the problem of habituation to training sessions by helping the subject remain cognitively involved in the task of relaxation. By placing demands upon specific criteria, this helps the subject develop a more acute awareness of the relaxation state. If a therapist develops a program for total situational reduction of anxiety, the patient must be able to generalize the relaxation technique to situations outside the therapy setting to ensure maximum success of anxiety reduction. Further formal research might systematically examine these variables to more precisely determine their role in relaxation training as it relates to anxiety reduction.

CORRECTION



***PRECEDING IMAGE HAS BEEN
REFILMED
TO ASSURE LEGIBILITY OR TO
CORRECT A POSSIBLE ERROR***

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